In the claims:

1 – 242. (canceled)

243. (new) A device for detecting a presence of an analyte in a sample comprising a device body configured with at least one reaction chamber configured for containing a sensor capable of producing a detectable signal when exposed to the analyte in the sample, said at least one reaction chamber being in fluid communication with at least one sample port and at least one actuator port via a first set of microfluidic channels arranged such that application of a negative pressure to said at least one actuator port delivers fluid placed in said at least one sample port to said at least one reaction chamber.

244. (new) A system for detecting at least one analyte present in a sample, the system comprising:

a detecting device having a plurality of reaction chambers and a plurality of channels interconnecting at least a portion of said plurality of reaction chambers, wherein at least a portion of said plurality of reaction chambers comprises a sensor, capable of generating a detectable optical signal when exposed to the at least one analyte;

a planar light detector capable of receiving optical signals from said detecting device and providing an image of sensors generating said optical signals.

245. (new) The system of claim 244, further comprising a data processor, supplemented by an algorithm for receiving image information from said planar light detector and determining presence of the at least one analyte.

246. (new) The system of claim 244, further comprising a control unit for sending control signals to said detecting device.

247. (new) The system of claim 244, further comprising a temperature control unit for controlling a temperature of said detecting device and/or said planar light detector.

248. (new) The system of claim 245, wherein said algorithm is capable of determining concentration of the at least one analyte.

249. (new) The system of claim 244, wherein said plurality of reaction chambers are configured so as to enable sustaining a negative pressure environment within said plurality of reaction chambers.

250. (new) The system of claim 244, wherein at least a portion of said plurality of reaction chambers are sequentially interconnected via at least a portion of said channels.

251. (new) The system of claim 244, wherein a body of said detecting device is capable of allowing transmission of light having a predetermined wavelength therethrough.

252. (new) The system of claim 244, wherein said sensor is a biological sensor.

253. (new) The system of claim 244, wherein said biological sensors is capable of producing a bioluminescent material.

254. (new) The system of claim 244, wherein said biological sensors is capable of producing a phosphorescent material.

255. (new) The system of claim 244, wherein said biological sensor is capable producing a fluorescent material.

256. (new) The system of claim 244, wherein said planar light detector comprises a matrix having a plurality of addressable elementary units, each being capable of converting said optical signal into an electrical signal.

257. (new) The system of claim 244, wherein said planar light detector is selected from the group consisting of a CCD camera and a CMOS detector.

258. (new) The system of claim 244, further comprising a light source for emitting excitation light so as to excite said sensor to thereby emit said optical signal.

259. (new) The system of claim 258, further comprising at least one selective filter positioned between said detecting device and said planar light detector, said at least one selective filter being capable of transmitting said optical signals and preventing transmission of said excitation light.

260. (new) The system of claim 258, further comprising a plurality of optical fibers for guiding said excitation light into said detecting device.

261. (new) The system of claim 244, further comprising an optical focusing device for focusing said optical signal on said planar light detector.

262. (new) The system of claim 244, further comprising a transport mechanism for actuating transport of a sample fluid in said plurality of fluid channels, thereby to fill said plurality of reaction chambers with said sample fluid.

263. (new) The system of claim 262, wherein said transport mechanism comprises a pumping device, capable of generating a negative pressure in said plurality of reaction chambers and said plurality of fluid channels.

264. (new) The system of claim 263, wherein said pumping device comprises a plurality of micro-pumps

265. (new) A device for detecting at least one analyte present in a sample, the device comprising at least one array of reaction chambers, each array having a plurality of reaction chambers, sequentially interconnected by a plurality of fluid channels, in a manner such that each reaction chamber is in direct fluid communication with at least two other reaction chambers, whereby a first reaction chamber of said at least two other reaction chambers serves as a fluid source and a second reaction chamber of said at least two other reaction chambers serves as a fluid sink, wherein each reaction chamber is designed for containing a sensor capable of generating a detectable signal when exposed to the at least one analyte.

266. (new) A device for detecting at least one analyte present in a sample, the device comprising a substrate configured with:

(a) a plurality of chambers for holding a fluorescent sensor and incubating reaction between said fluorescent sensor and the at least one analyte;

(b) a plurality of fluid channels interconnecting at least a portion of said plurality of chambers; and

(c) a plurality of waveguides designed and constructed to distribute excitation light among said plurality of chambers in a manner such that impingement of said excitation light on said fluorescent sensor is maximized and impingement of said excitation light on a surface of said substrate is minimized.

267. (new) An apparatus for imaging a pattern of optical signals received from a fluorescent material arranged in a plurality of predetermined locations, the apparatus comprising:

(a) a planar light detector engaging a first plane;

(b) a optical element engaging a second plane substantially parallel to said first plane;

(c) a light source interposed between said first and said second planes, said light source capable of generating excitation light in a direction other than a direction of said planar light detector;

said optical element and said planar light detector being designed an constructed such that said excitation light is collimated by said optical element and impinges on at least a portion of said plurality of predetermined locations, and emission light, emitted by said fluorescent material in response to said excitation light, is focused by said optical element and impinges on said planar light detector, to form the pattern of the optical signal thereupon.

268. (new) A method of determining concentration of an analyte from optical signals recorded of a reaction chamber in response to excitation light, the reaction chamber containing a plurality of biological sensors producing a fluorescent material when exposed to the analyte, the method comprising:

(a) defining a plurality of slices, each slice having at least one biological reporter;

(b) for each slice, representing said at least one biological reporter as at least one equivalent light emitter, located at a predetermined location within said slice, and calculating local radiation contribution emitted by said at least one equivalent light emitter; and

(c) integrating said local radiation contribution over said plurality of slices so as to obtain an integrated radiation intensity; and

(d) using the recorded optical signals and said integrated radiation intensity for determining the concentration of the analyte.

269. (new) A method of detecting analytes in a sample fluid, comprising:

(a) providing a device having a plurality of reaction chambers and a plurality of channels, interconnecting at least a portion of said plurality of reaction chambers, wherein each one of said plurality of reaction chambers comprises a biological sensor, capable of generating a detectable signal when exposed to the at least one analyte;

(b) filling at least a first portion of said plurality of reaction chambers with the sample fluid;

(c) generating a condition for said biological sensor to generate said detectable signal; and

(d) detecting said detectable signal thereby detecting the analytes in the sample fluid.